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ABSTRACT

The purpose of this conference was to discuss the implications on the teaching and learning of mathematics of the system of objectives and assessment instruments that must be generated in order to meet state directives in Illinois. General overall concerns included: (1) the classroom teacher and district administrators may view the testing as sufficient reason to stress only computational skills in the mathematics classroom; (2) meeting the proposed model learning objectives will necessitate substantial resequencing of the mathematics currently being taught; and (3) teaching materials will need to be developed. The directive that each school district develop appropriate testing and assessment systems and assess the proficiency of all pupils enrolled in grades 3, 6, 8, and 10 also resulted in specific concerns for each testing level. Following two reports from Illinois State Board of Education personnel, position papers are presented on: (1) mathematics outcome statements K-3; (2) the effect of state-mandated testing on mathematics education in Illinois; (3) concerns of junior high school teachers of mathematics; (4) the impact of educational reform on high school mathematics; and (5) a report on grades 11 and 12. (MNS)

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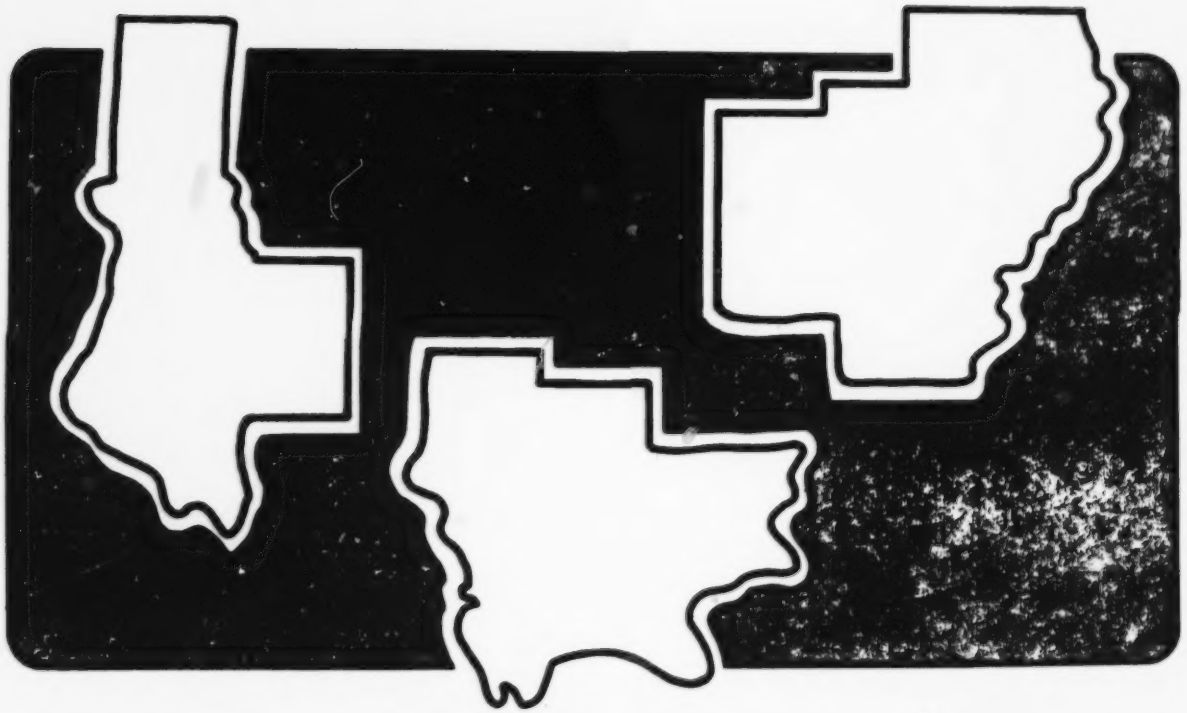

PROCEEDINGS
OF
SOUTHERN ILLINOIS MATHEMATICS LEADERSHIP CONFERENCE II

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Proceedings of

Southern Illinois Mathematics Leadership Conference - II

Co-Sponsored By

Southern Illinois University, Carbondale
Southern Illinois University, Edwardsville
Illlinois Council of Teachers of Mathematics
Renewal Institute for Practicing Educators
Educational Service Center 16
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PROCEEDINGS OF SOUTHERN ILLINOIS
MATHEMATICS LEADERSHIP CONFERENCE - II

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EXECUTIVE SUMMARY

"... Each school district shall establish learning objectives consistent with the primary purpose of schooling, shall develop appropriate testing and assessment systems for determining the degree to which students are achieving the objectives..." (PA 84:126. Ch. 122, par. 27-1)

"...The State Board of Education shall require that school districts assess the proficiency of all pupils enrolled in the 3rd, 6th, 8th, and 10th grades..." (PA 84:126. Ch. 122, new paragraph 2-3. 64)

"As a result of their schooling, students will be able to:

- perform the computations of addition, subtraction, multiplication, and division using whole numbers, integers, fractions and decimals;
- understand and use ratios and percentages;
- make and use measurements, including those of area and volume;
- identify, analyze and solve problems using algebraic equations, inequalities, functions and their graphs;
- understand and apply geometric concepts and relations in a variety of forms;
- understand and use methods of data collection and analysis, including tables, charts and comparisons;
- use mathematical skills to estimate, approximate and predict outcomes and to judge reasonableness of results." (Mathematics Outcome Statements, Illinois State Board of Education.)

The purpose of Southern Illinois Mathematics Leadership Conference - II was to discuss the implications on the teaching and learning of mathematics of the system of objectives and assessment instruments that must be generated in order to meet these directives. Several specific concerns were expressed for each testing level; the following reflect general overall concerns:

- *The classroom teacher and district administrators may view the testing as sufficient reason to stress only computational skills in the mathematics classroom.*

The pressure to score well on the state-wide tests will be felt by all district personnel. It is possible that teachers will become most concerned with stressing paper and pencil skills to the exclusion of items not included in the testing. In recent years, mathematics teachers have become aware that time must be spent implementing problem solving activities in the classroom if the child is to become a problem solver. This approach takes practice and involves time. Pressure may be placed on the classroom teacher to drill and review computational skills in order to achieve proficiency in the state-wide test. The time spent for the drill and review may condense or possibly eliminate the quality time spent on problem solving activities.

- *Meeting the proposed model learning objectives will necessitate substantial resequencing of the mathematics currently being taught.*

In some instances, i.e., measurement and geometry at grade 3, data collection and analysis at grades 3, 6, and 8, estimation skills at all levels, material will have to be added to the traditional mathematics curriculum. In other instances, i.e., fraction concepts at grade 3, algebraic concepts at grade 10, the material will have to be taught earlier in the school year or at an earlier grade level.

- *Teaching materials will need to be developed.*

Material for teaching, for example, geometry, measurement, data collection and analysis, at the K-3 level, is not in the standard textbook. These subjects are not fully treated in most texts at any level, K-9. Thus, supplementary materials will have to be prepared. High schools are discussing general level courses in geometry and in data collection and analysis; new texts will have to be developed that are consistent with the model learning objectives as well.

CONFERENCE OVERVIEW

Katherine Pedersen

Alison Owens

In February, 1985, the Illinois State Board of Education and the Illinois Council of Teachers of Mathematics co-sponsored the first Southern Illinois Mathematics Leadership Conference. Because of the success of, and continuing interest in, regional as well as State mathematics leadership conferences, the Illinois Council of Teachers of Mathematics and Educational Service Centers 16, 17, and 18 (Egyptian) joined with the Carbondale and Edwardsville campuses of Southern Illinois University and the Renewal Institute for Practicing Educators to sponsor Southern Illinois Mathematics Leadership Conference - II (SIMLC-II). The purpose of the Conference was to study the implications of the Educational Reform Package (Public Act 84:126) to the teaching and learning of mathematics. In particular, the following were defined as the purposes of the Conference:

1. To identify specific student performances to be expected at grades 3, 6, 8, and 10 by students who meet the State objectives in mathematics.

2. To identify curricular changes necessary to prepare students to meet the State objectives in mathematics.

3. To communicate the results of the Conference to the Illinois State Board of Education through its subcommittees, to Regional and District Superintendents, to teachers of mathematics, and to school administrators, among others.

SIMLC - II was held from 1:15 - 4:20 p.m. Saturday, February 22, 1986, in the Wham Building on the campus of Southern Illinois

University, Carbondale. Conference participants were nominated by the regional superintendents served by Educational Service Centers 16 and 17 and Egyptian Educational Service Center 18; participants were also nominated by the Illinois Council of Teachers of Mathematics. A list of the Conference participants is found in Appendix A.

Wendell Meeks, Program Planning and Development, Illinois State Board of Education, and Dr. Mervin M. Brennan, Program Evaluation and Assessment, Illinois State Board of Education, addressed the conference participants regarding the Mathematics Clarifying Objectives and the State Board of Education assessment program, respectively. Copies of their papers are included in the Proceedings.

During the working sessions which followed the opening addresses, the participants met with others at their same grade level. Prior to the Conference, participants were asked to familiarize themselves with several documents relative to the purpose of the Conference. The participants were also asked to bring to the Conference their interpretations of the mathematics clarifying objectives relative to their specific grade levels. The chair and secretary of each discussion group assumed responsibility for preparing a report that incorporated concerns and comments expressed during the working sessions as well as written reports submitted by conference participants. The discussion group reports were presented to the Conference during the closing session.

Representatives of each grade level (K-3, 4-6, 7-8, 9-12) were selected to prepare a position paper for inclusion in the Conference Proceedings. The position papers are meant to reflect the concerns expressed at the Conference as well as additional material selected by the individual authors as related to the conference theme.

FROM OUTCOMES TO OBJECTIVES
SIMLC-II, February 22, 1986

Wendell Meeks

According to the 1982 State Board study of Instructional Program Mandates, the state had not clearly defined what it considered to be the primary purposes for schools.

Over the last 150 years, schools in Illinois had been assigned, both formally and informally, an ever-expanding list of responsibilities. While some of these were directly related to the traditional responsibilities of schools, many were the result of societal pressures or expectations.

The result was a hodge-podge of requirements, both in regulation and statue, that did not present a clear, comprehensive picture of what the state believed were the most important tasks of schools.

Over the years it had become apparent that, given the number of requirements and expectations placed on schools and the increasingly insufficient amount of time available to address them, changes had to be made with regard to the schools' primary responsibilities, or the amount of time required for schooling, or both.

In response to this situation, the State Board of Education developed a working definition of schooling which it believed should be used as a guide for decision makers at every level as they consider changes related to education. The following definition defines the primary purpose of schools and the relationship of schools to other social agencies.

Definition of Schooling

1. Schooling is a formal process which has as its primary purpose the systematic transmission of knowledge and culture, whereby children learn in areas fundamental to their continuing development.
2. These fundamental areas of learning are the language arts, mathematics, sciences, social sciences (history, government, geography, and economics), the fine arts, and physical development and health.
3. Although schools have a shared interest with other agencies and institutions in the education of children and youth, these shared responsibilities, as important as they may be, are subordinate to the primary purpose of schooling.

As a further result of its Instructional Program Mandates Study, the State Board concluded that requiring a quantity of coursework to be taken by students is not an appropriate way for the state to assure student learning.

Illinois law identifies several specific subjects or courses which schools must offer and students must take. However, the laws have been virtually silent, up to this time, on traditional areas of instruction such as mathematics, language arts and science, and there are almost no references to what students are expected to achieve. Overall, the state's laws neither contained a full instructional program, nor did they address what students should know and be able to do as a consequence of their schooling.

The Board believed that the state should demonstrate its compelling interest in an educated citizenry by putting into law requirements related to student learning which would do the following:

A. Identify what the state expects students to at least know and be able to do as a result of their schooling.

State law should define, through outcome statements written in broad, generaly timeless terms, what students should at least know and be able to do as a result of their schooling. These statements should focus on at least six fundamental areas of learning--language arts, mathematics, sciences, social sciences, fine arts, and physical development and health--and should represent what the state believes is minimally necessary for an educated citizenry.

The proposed outcome statements would not limit what schools do; in fact, it would be expected that school districts would identify additional expectations for students that represent the goals and desires of their communities. The use of outcome statements for handicapped students will be governed by their Individualized Educational Plans.

At the direction of the Board, the State Superintendent, convened an 85-member committee of business executives, professional educators, local school officials, and parents to assist in the development of these outcome statements. Chaired by Dr. John Corbally, the President of the MacArthur Foundation

and President-Emeritus of the University of Illinois, the Committee to Define State Requirements for What Students Should Know and Be Able To Do presented its recommendations to the State Board of Education. Following public comment about the statements, the State Board sought legislation to substitute the statements, in final form, for the existing program mandates. In the 1985 educational reform package, the outcome statements were adopted as law, but they haven't yet replaced existing mandates.

B. Allow local school districts to organize their instructional program in whatever way they deem necessary to ensure that students achieve these desired outcomes.

Local school districts are in the best position to determine how the instructional program should be organized so that students meet the requirements established by law. To implement the proposed new system of state requirements related to student learning, school districts are required to develop specific objectives, consistent with the outcome statements, that would address local needs and circumstances. Districts have the responsibility and flexibility to determine what courses should be taught and when, what learning activities students should be involved in, and what other learning activities should be made available.

The State Board of Education will establish criteria and

guidelines for its review and approval of local district objectives. The Board would also provide local school districts with technical assistance through Educational Service Centers.

C. Establish the conditions necessary for holding schools accountable for student learning.

There are currently several ways to evaluate the performance of Illinois public schools: periodic State Board checks on whether or not required courses are offered and taken, the subjective judgment of parents and community members in each school district, and testing programs such as the SAT and the ACT. However, none of these methods systematically addresses the question of how well all students are achieving or how well schools are helping students to learn.

As a result of its study, the Board concluded that the new system for state requirements related to student learning must include a method for determining how well students are meeting the state's learning outcomes and local district objectives.

The Board proposed that each school district be required to use a variety of tests and other measurement tools to regularly assess how well students are learning. In particular, the assessment should focus on how well students are meeting the outcome statements and local objectives.

From Notice of Hearings - Draft Definition of Schooling and Proposed Statements for Student Learning.

The State Board of Education will be responsible for assisting school districts in developing an appropriate local assessment system and for approving systems that are consistent with the outcome statements.

The Board further believed that student achievement information should be used by local school districts to modify their instructional program in areas where students may not be meeting the desired outcomes. Public reporting of achievement information would give local communities and the State a clearer picture of how well students are achieving and being served by the schools. The Board therefore proposed that a process for reporting and using asessment results be made a part of the new state requirements related to student learning.

As was stated previously, the original Outcome Committee was composed of 85 members. The Mathematics Subcommittee contained 15 members and three ISBE employees. A list of original subcommittee members is included in the addendum.

The original task of the subcommittee convened in the fall of 1983 was to define in broad terms what students should know, and be able to do as a result of their schooling. The outcome statements developed were accepted by the State Board in the spring of 1984 and incorporated into the Education Reform Package by the legislature in the summer of 1985. There were some outcomes that were appropriate for several areas of learning that were included in the package as general outcomes. These are also included in the addendum.

In November of 1985, new members were added to the mathematics subcommittee.

These additional members helped to facilitate the new charge of the subcommittee; to translate the outcome statements into general objectives by providing a broader base of educational representation. The general objectives are now called clarifying statements since they serve to further explain the outcome statements.

This task of the mathematics subcommittee was completed in mid-January of 1986. Their next task was to take the clarifying statements and write a set of Model Learning Objectives as examples of objectives school districts could use to structure their mathematics program to ensure that they would at least encompass the complete thrust of the mathematics outcome statements. The districts are free to adopt, adapt, or completely ignore the Model Learning Objectives. If a district wishes to write its own learning objectives, it is to make sure that it addresses all of the clarifying statements. Districts are encouraged to go beyond the clarifying statements in its expectations for its students.

The six-member committee that is presently writing the Model Learning Objectives must be finished by February 28. The MLO's will be sent out to school districts by the end of March.

Following the publication of the Model Learning Objectives, another committee will use them to write objectives for test items to be included on every local district evaluation instrument. Examples of this committee's work will be made available to school districts so districts will have some idea of the types of questions that the ISBE will be interested in.

STUDENT OUTCOMES, DISTRICT OBJECTIVES, AND ASSESSMENT: PHILOSOPHY, HISTORY, AND EXPECTATIONS OF THE ILLINOIS LEGISLATION OF 1985

Mervin M. Brennan

Education always lives in the tension of at least 3 everyday philosophies: educational idealism, legal accountability, and administrative compromise. Let us mention each of them with a brief description, because each philosophy was influential in shaping the Illinois Educational Legislation of 1985 and each philosophy will continue to influence the educational future we are all engaged in.

Educational Idealism. Professional educators and parents are the chief proponents and practitioners of educational idealism. A description of this philosophy goes like this: We want to help all students arrive at their fullest potential. We look at the universe of knowledge that can be acquired, and we know some of the challenges and steps that students must take to make progress toward their potential. We then look at our students and evaluate their position on this road to knowledge. We look at their ability, their background, their energy, their motivation, their emotions, their situation in as many ways as we can. Finally, we try to put three things together,--the ideal of possible attainment for each student, the potential of that student in his or her present situation, and a present goal that is realistically attainable for that student in the near future. That is, we are like good

athletic coaches. We take a good look at our students, we set up challenges for them that are three or four steps ahead of their present development, but challenges that they can reach, and we pull, push, excite, drive, criticize, compliment, support, encourage, and whatever else it takes...to help them as far along and as fast as it makes sense for them to go.

Legal Accountability. This is the conservative approach. It stresses goals and objectives, wants them set up, and wants practitioners held accountable to accomplish them. Some of the descriptions of the accountability approach go like this: The citizens of this state know what they want, at least to some extent, and they don't think they're getting it. When you buy a product, you expect it to work, you demand a guarantee, and if it doesn't work you take it back and get a new one free or get it fixed free. Schools need to do the job much better than they are doing. Education has been around a long time, and there has been all kinds of money and research poured into it for years by now. Educators ought to know what they are doing, and they ought to be producing a much better product. We hold manufacturers accountable for their products; we are now going to hold educators accountable for their products. Every graduate of our high schools ought to be able to read, write, and compute. They also ought to know a reasonable amount about science, social studies, fine arts, and physical development/health. Taxpayers are putting out a considerable amount of money to bring about solid education of the young people of this state, and they want the schools to be held accountable to do so. The students of many other countries

surpass the students of this state in academic accomplishments, and there is no good reason for it. The United States has a higher standard of living, more money, and more resources than any other nation in the world. The students of Illinois and this nation should be the best in the world. Why aren't they? There need to be clearly established expectations (i.e., laws which determine minimal competencies), tests to measure student accomplishment, and legislative action taken to see that schools meet the standards which taxpayers are demanding.

Administrative Compromise. This is the position of the practitioner in the real world. It is the dynamic of supporting the aspirations and efforts of educational idealism while at the same time fulfilling the demands of legal accountability. You find the philosophy of administrative compromise in policy bodies. It is the world of informal politics in the sense of the "art of the possible" in the real world. State offices, state officials, and district administrators exemplify this philosophy, which usually sounds like "Well, yes...and no!" "That's right up to a point!" "On the one hand...yes, but on the other hand..." "...sort of...". The State Board is in the position of working in the compelling state interest. All students should be educated to their fullest capacity. But we must enforce the law. Schools are free to set their own objectives, but these must meet or exceed those of the State Board. Schools are encouraged to develop their own assessment system, but they will also be tested on the anchor items provided by the State Board. The State Board of Education is in a position similar to that of sailors. It works to get the

educational sailboat to an ideal destination, but it must do so by constantly tackling to take advantage of the prevailing winds. At times, like now, the prevailing wind is legal accountability; at other times, as in the late 50's and early 60's the prevailing wind was educational idealism. And the winds kept changing. Within the larger context there are many brief gusts or longer gentle breezes of educational idealism within the dominant winds of legal accountability, or brief gusts of legal accountability within the overall prevalence of educational idealism. It is the philosophy of administrative compromise that makes administrators look vacillating and "wishy-washy", that makes for statements like "I'll do what I can" or "Okay for now, but let me check", because sometimes the winds of educational idealism and those of legal accountability are in the same direction,...and sometimes they are not.

History

From 1930 to the late 1950's and 1960's the prevailing societal attitudes favored the philosophy of educational idealism. The labor market, affluence, the economy, beginning of high tech and parental desires that their children have it better than they did, supported more education and the tenets of education idealism.

But then came concern about student achievement, a less rapidly expanding economy, a tighter job market, and a surplus of teachers. The legal accountability people began to speak up more and more. News of dropout rates, illiterates, and lower achievement scores became headlines and accountability became a stronger theme.

Minimal competency testing swept the country in the middle and late 1970's. By 1980, commissions were instituted, studies undertaken, and the media was in hot pursuit, all in critique of education.

Reports came out in bunches, and few of them were complimentary to education. Some of these were "Education in the Sciences: A Developing Crisis" (American Association for the Advancement of Science); "National Convocation on Precollege Education in Mathematics and Science" (National Academy of Sciences); "Educating Americans for the 21st Century" (National Science Board Commission on Precollege Education in Mathematics, Science, and Technology); and "A Nation at Risk" (National Commission on Excellence in Education.)

In Illinois, the 1980's have seen reports from the State Board's Phase I Mandates Studies, Governor Thompson's Task Force on Education, the Illinois Legislature's Commission on the Improvement of Elementary and Secondary Education, Michael Bakalis' Citizen's Committee on Education, House Speaker Madigan's Community Conference on Education Reform and School Improvement, and the State Board's Corbally Comittee on Student Learning Outcomes.

The present result of this history is the 1985 legislation known as Public Act (PA) 84:126 (originally Senate Bill (SB) 730, which contains 169 legislative initiatives in regard to education. The volume of this legislation has meant that the State Board and school districts in particular have an enormous task in attempting to implement and fulfill that legislation.

For purposes of this conference let us review briefly what led up to the present situation in regard to mathematics and then discuss what appears to be indicated for the near future.

The State Board's Mandate Studies (1981-83) identified a significant problem with respect to the manner in which the state established requirements for schools, especially in the area of instruction. These studies showed that the state (1) had never identified the primary purposes of learning nor established priorities among the learning areas; (2) had mandated courses and required amounts of instruction, but had never indicated what students were expected to know and be able to do as a result of the instruction; (3) had adopted a variety of instructional and noninstructional mandates which took resources, including student time, away from what have been traditionally considered the fundamental areas of learning; and (4) had not established any systematic procedures for accountability regarding student learning.

The Illinois Commission on the Improvement of Elementary and Secondary Education and other study activities in Illinois also identified similar problems. All seemed to agree that there needed to be more focus to the instructional program, greater accountability and, above all, improved student achievement. At the national level, comparable concerns emerged from several prominent studies, e.g., those mentioned above.

The Primary Purpose of Schooling

The education reform legislation in Illinois fuses recommendations about school accountability, program and curriculum

evaluation, as well as student testing, into one package. Essentially, PA 84:126 (Senate Bill 730) provides for the following in terms of instructional programs and accountability.

(1) Primary Purpose of Schooling

The bill establishes the primary purpose of schooling as the transmission of knowledge and culture through which children learn in areas necessary to their continuing development. These areas include language arts; mathematics; science; social studies; the fine arts; and physical development/health. Local school districts are expected to give priority to these areas in the allocation of their resources.

(2) Student Learning Outcomes

The State Board of Education has been charged with developing state goals for learning in each of the six primary areas of schooling. The State Board goals in regard to mathematics which are identical to the Board's Student Learning Outcomes are the following:

MATHEMATICS

Mathematics provides essential problem-solving tools applicable to a range of scientific disciplines, business and everyday situations. Mathematics is the language of quantification and logic; its elements are symbols, structures and shapes. It enables people to understand and use facts, definitions, and symbols in a coherent and systematic way in order to reason deductively and to solve problems.

As a result of their schooling, students will be able to:

- perform the computations of addition, subtraction, multiplication, and division using whole numbers, integers, fractions and decimals;
- understand and use ratios and percentages;
- make and use measurements, including those of area and volume;
- identify, analyze and solve problems using algebraic equations, inequalities, functions and their graphs;
- understand and apply geometric concepts and relations in a variety of forms;
- understand and use methods of data collection and analysis, including tables, charts and comparisons;
- use mathematical skills to estimate, approximate and predict outcomes and to judge reasonableness of results.

Local school districts must establish learning objectives consistent with these state goals, develop appropriate testing and assessment systems to determine the degree to which students are achieving the objectives, and develop reporting systems to apprise the community and the state of the results. The local objectives and assessment and reporting systems must be submitted to the State Board of Education for approval. During the next several months, using a representative and participatory process, the State Board of Education will develop model objectives and, by the spring of 1986, make them available for use by local school

districts. By the fall of 1986, the State Board of Education will establish a process for approving local plans which will minimally include reading objectives for grades 3, 6, 8, and 10, planned on a K-12 basis; timelines for addressing all other learning areas; plans for public reporting; and plans for developing learner improvement activities. These plans will first be submitted for approval by late spring of 1987. By the spring of 1988, the plans will be amended to include mathematics; by the spring of 1989, language arts.

The State Board will have model learning objectives available to school districts by early April, 1986. A partial list of the State Board's model learning objectives (in their present draft stage) is given below for Mathematics Outcome 7 (Outcome 7); clarifying statements 1 (7-1 Round numbers), 2 (7-2 Estimate present and future values...), and 3 (7-3 Apply intervals as estimates); for grade 3 (7-1.3.1 Round whole numbers less than 1000...); grade 6 (7-1.6.1 Round any whole number...); grade 8 (7-1.8.1 Determine what original values...); and grade 10 (7-2.10.1 Given a graph of values over time...). In the number 7-3.8.2 the "7" means "Outcome #7"; the "3" means "clarifying statement #3"; the "8" means "grade 8"; and the "2" means "model learning objective #2". Putting it together 7-3.8.2 means "Outcome 7; clarifying statement 3; grade 8; model learning objective 2", which is "Express answers as intervals when given information is so expressed..."

Outcome 7: As a result of their schooling, students will be able to use mathematics skills to estimate, approximate,

and predict outcomes and to judge reasonableness of results.

In many situations, exact values are impossible, unrealistic, or unnecessary to obtain. Estimation is the process by which one obtains a reasonable value in such situations. The procedures of estimation are partners to the procedures which give exact answers; careful reasoning and problem solving strategies apply to estimation as they do to exact procedures. Estimation procedures may be done mentally, with paper and pencil, or with calculator and computer.

At an appropriate level of complexity, students will:

7-1 Round numbers.

7-1.3.1 Round whole numbers less than 1000 to a specified place value. (Example: Round 47 to the nearest 10.)

7-1.6.1 Round any whole number to a specified place value.

7-1.6.2 Round any decimal number to a specified place value. (Example: Round 3.14159 to the nearest hundredth.)

7-1.6.3 Round any fraction to the nearest whole number.

7-1.8.1 Determine what original values might have resulted in a given rounded value.

7-1.8.2 Describe how calculators round or truncate numbers.

7-1.8.3 Estimate square roots of whole numbers to the nearest whole number without a calculator.

7-1.8.4 Estimate square roots of any number with a calculator.

7-1.8.5 Round any positive or negative number to the nearest integer.

7-2 Estimate present and future values from graphs or numerical information.

7-2.6.1 Identify trends or the absence of trends in quantities graphed or tabulated over time.

7-2.6.2 Estimate intermediate values in data collected over time.

7-2.8.1 Estimate past or future values given values in a trend. (Example: If the population of a town was 25,000 in 1970 and 28,000 in 1980, and the population continues to grow steadily, estimate the population in the year 2000.)

7-2.10.1 Given a graph of values over time, select an appropriate equation describing the relationship over time and use that equation to estimate values not given.

7-3 Apply intervals as estimates.

7-3.3.1 Tell whether a given whole number is between two others.

7-3.8.1 Select the appropriate estimate for an answer to a problem. (Example: If given one significant digit in one factor, the answer cannot be trusted to more than one significant digit.)

7-3.8.2 Express answers as intervals when given information is so expressed. (E.g., if the length of a rectangular room is ...).

School districts are required to submit district learning objectives which will minimally include objectives at grades 3, 6, 8, and 10 planned on a K-12 basis. The objectives are to be submitted to the State Board according to the following schedule:

reading objectives by the spring of 1987, mathematics objectives by the spring of 1988, and language arts objectives by the spring of 1989. Decisions have not been made yet on timelines for submission of local district objectives in science, social studies, fine arts, and physical development/health.

(3) Student Assessment and Report Card

The 1985 legislation includes the following paragraphs.

(Ch. 122, par. 27-1)

"...Each school district shall establish learning objectives consistent with the primary purpose of schooling, shall develop appropriate testing and assessment systems for determining the degree to which students are achieving the objectives and shall develop reporting systems to apprise the community and State of the assessment results.

Each school district shall submit its objectives and assessment and reporting systems to the State Board of Education, which shall promulgate rules and regulations for the approval of the objectives and systems."

(Ch. 122, new para. 2-3.64)

Sec. 2-3.64. Student assessment. (a) The State Board of Education shall require that school districts assess the proficiency of all pupils enrolled in the 3rd, 6th, 8th and 10th grades, other than pupils receiving special educational services under Article 14 of this code in meeting the objectives specified in Section 2-3.63. Pupils enrolled in the 3rd, 6th and 8th grades

must be assessed in at least the following subjects by the date specified and thereafter as follows: reading by the end of the 1987-88 academic year, reading and mathematics by the end of the 1988-89 academic year, and reading, mathematics and language arts by the end of the 1989-1990 academic year. All pupils enrolled in the 10th grade shall take student assessment tests in the following subject matter areas: (a) reading beginning during the 1989-90 school year; (b) reading and mathematics beginning during the 1990-91 school year; and (c) reading, mathematics and language arts beginning during the 1991-92 school year. The State Board of Education shall prescribe the assessment procedures to be used; shall insure that test items necessary for State reporting are included; and shall provide model assessment procedures from which school districts may select. The State Board of Education shall establish a common month in each school year for which testing shall occur to meet the objectives of this Section.

School District Report Cards

(Ch. 122, new para. 10-17a)

"...(3) (a) The report card shall include the following applicable indicators of attendance center, district and statewide student performance; percent of students placed in top and bottom quartiles of nationally normed achievement tests; composite and subtest means for college bound students..."

"...(b) It shall be the policy of the State to encourage school districts to continually assess pupil proficiency and to discourage promotion from grade to grade for purely social reasons. Pupils who by teacher judgement and assessment results as prescribed in

subsection (a) of this Section, demonstrate a proficiency level comparable to the average pupil performance one grade or more below current placement shall be provided with an individual remediation plan developed by the school district in consultation with a parent or guardian. Such remediation plans may include summer school, extended school day, special homework, tutorial sessions, modified instructional materials, other modifications in the instructional program, reduced class size or retention in grade. Nothing in this section shall prevent school districts from implementing testing and remediation policies for grades not required under this Section."

It would appear that the legislation of PA 84:126 (SB 730) intends local district objectives, assessment systems, and reporting requirements to be a unified package. That is, school districts are minimally required to:

1) develop objectives which meet or exceed the state learning goals;
2) administer nationally normed achievement tests to all 3rd, 6th, 8th and 10th grade students at least;
3) administer test items provided by the state to all 3rd, 6th, 8th, and 10th grade students at least; and
4) obtain from the testing companies, the State Board, or elsewhere the scores of its students on the Scholastic Aptitude Test (SAT) and American College Test (ACT).

It would also appear from the legislation that school districts must submit to the State Board for approval an assessment plan which includes the following:

1) the nationally normed achievement test it plans to administer, and
2) the methodology and instruments it plans to use for its student, school, and district assessment(s).

Also in addition, school districts will be required to report to their communities (on a report card form designed by the Illinois State Board of Education:)

1) for students in each academic subject, each grade (3, 6, 8, and 10), each school, the district as a whole, and the state as a whole, the percent of students scoring in the top 25% of the nation and the percent scoring in the bottom 25% of the nation;
2) the mean score for each academic subject, each grade (3, 6, 8, 10), each school, the district as a whole, and the state, on the test items provide by the state.
3) the subtest and composite mean scores for each high school, the district as a whole, and the state as a whole, -on the Scholastic Aptitude Test (SAT) and the American College Test (ACT).

Finally, in ways yet to be determined these processes from state goals to district objectives, followed by state and local assessment are to lead to district plans for improvement so that school districts are making constant efforts to set target goals, implement programs effectively, assess the results, and set new target goals on the results. Let me conclude by going through

the chart: (Table I, on the following 2 pages).

As best I have been able to determine, I have described the present projections for implementation of the 1985 legislation. The projections are based on what I perceive to be the current interpretations of the law and tentative plans for its implementation. Undoubtedly, time and events will lead to some new interpretations. I welcome any comments, critiques, and questions.

TABLE 1
Timelines for Some Requirements of PA 84-126 (SB 730)

District Learner Objectives and Assessment Plans	Nationally normed tests in Reading, Math, and Language Arts, at grades 3, 6, 8, and 10	State test items	Scores on the SAT and ACT	Report card to local communities
(Spring, 1986)	No new administration required (Spring, 1986)	Not required (Spring, 1986)	Must be obtained (Spring, 1986)	1) Results of national normed tests given at grades 3, 6, 8, and 10 2) SAT and ACT results (October, 1986)
	To be administered (Spring, 1987)	Not required (Spring, 1987)	To be obtained (Spring, 1987)	1) Results of national normed tests 2) SAT and ACT results (October, 1987)
Reading 3, 6, 8 (Spring, 1987)	(Spring, 1988)	Reading 3, 6, 8 (Spring, 1988)	(Spring, 1988)	1) National normed tests results 2) SAT and ACT results 3) State item results in Reading 3, 6, and 8 (October, 1988)
Math 3, 6, and 8 (Spring, 1988)	(Spring, 1989)	Reading and Math 3, 6, and 8 (Spring, 1989)	(Spring, 1989)	1) National normed test results 2) SAT and ACT results 3) State item results in Reading and Math 3, 6, and 8 (October, 1989)

Language Arts 3, 6, and 8 Reading 10 (Spring, 1989)	(Spring, 1990)	Reading, Math, and Language Arts 3, 6, and 8 Reading 10 (Spring, 1990)	(Spring, 1990)	1) National normed test results 2) SAT and ACT results 3) State item results in Reading, Math, and Language Arts 3, 6, 8 and Reading 10 (October, 1990)
Math 10 (Spring, 1990)	(Spring, 1991)	Reading, Math, and Language Arts 3, 6, and 8 Reading and Math 10 (Spring, 1991)	(Spring, 1991)	1) Nationally normed test results 2) SAT and ACT results 3) State item results in Reading, Math, and Language Arts 3, 6, and 8, Reading, and Math 10 (October, 1991)
Language Arts 10 (Spring, 1991)	(Spring, 1992)	Reading, Math, and Language Arts 3, 6, 8, and 10 (Spring, 1992)	(Spring, 1992)	1) Nationally normed test results 2) SAT and ACT results 3) Reading, Math, and Language Arts 3, 6, 8, and 10 (October, 1992)

*Decisions have not yet been made in regard to Science, Social Studies, Fine Arts, and Physical Development/Health.

POSITION PAPER FOR MATHEMATICS

OUTCOME STATEMENTS K-3

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1A. Perform computations of addition and subtraction using regrouping with and without zero.

Some pupils have difficulty renaming multiples of 100 in subtraction. I would suggest that some of these kinds of problems be avoided.

Ex. 500
-243

When adding a 1-digit number and a 2-digit number (or a 1-digit number and a 3-digit number), some pupils add all the digits.

Ex. 42 57 386
+3 +8 + 9

Some add the 1-digit number to each digit of the other number.

Ex. 53 68 607
+4 +5 + 8

These problems should be in simple form and very few on the test.

In addition problems where students need to carry twice when adding three-digit numbers may cause some problems on the math test and should be avoided.

Ex. 627
+483

1B. Recognize and write number names from 1-100.

There should be no problems with students recognizing written number words from 1-100 at this grade level. However, they do have serious problems with the concept of place value.

Some reasons or causes associated with place value are:

(1) Inability to discriminate place value in basic addition or

subtraction operations. (2) Lack of knowledge of such relationships as ten 1s = 10, ten 10s = 100, and ten 100s = 1,000. (3) Lack of adequate instruction in place value concepts. This test item should definitely be included.

Example: Write each number.

4 thousands, 3 hundreds, 8 tens, 5 ones = _____

9 thousands, 6 hundreds, 4 tens, 6 ones = _____

Give the number that is 1000 more:

3842 _____ 5617 _____ 2314 _____ 5638 _____

Give the number that is 100 less:

5634 _____ 2847 _____ 2956 _____ 7291 _____

Give the number that has:

5 in the ones place

2 in the hundreds place

8 in the thousands place

3 in the tens place

Write each number:

six thousand two hundred ninety-three _____

five thousand four hundred sixty-one _____

1C. Test multiplication: facts through 9.

Most districts require multiplication facts thru nine at third grade level. Teachers often times go to twelve. Test items should, however, be limited to one, two, and three-digit numbers times a single digit number.

1D. Test division: Use single digit division with simple remainders.

Students should be able to do these problems with little difficulty.

OUTCOME STATEMENT 2

2A. Recognize and compare fractions.

Our group thought students should be able (a) to write a fraction for a partly shaded region, (b) to show what part of a set of discrete objects has a given property and (c) to compare two fractions that are represented by figures.

In the group session, we felt that the concept of equivalent fractions should be tested by using comparisons with pictures and using the greater than and less than signs.

Students will work with fractions more in the future and should not be expected to master the subject at this time.

2B. Add and subtract decimals as money units only.

The group decided that the only way decimals are used at this grade level would be in adding or subtracting money problems. This is usually introduced in lower grades as a "dot" and or "period" which is used to separate the dollars and cents, or a cent sign written a different way when adding dollars and cents. Ex.: $1.25, $2.05, $.75.

2C. Understand the use of ratios in a story setting or problem solving situation only.

This skill is not used otherwise at this grade level.

2D. Delete percentages:

Does not apply at this grade level. Students will be expected to master this skill at a later time.

OUTCOME STATEMENT 3

3A. Make and use measurements, including those of area, perimeter and volume without changing measurements.

The group agreed that these skills should be test items. They are often taught near the end of the school year with measurements and geometry, and often times not taught at all because the school year has ended. Therefore, we felt that these measurements should be in simplest form. The concepts of area and volume should be test items that have students count squares and cubes. Centimeters and meters should be test items as units of measuring length only.

3B. Tell time to minute.

The group decided that these test items should include telling time at the hour, half-hour, quarter hour, at the five minute intervals and finally the minute. The items should include studying pictures of real clocks, and relating time to scheduled events.

The group didn't include A.M. or P.M. in this section. I feel that A.M. or P.M. is relevant and students should be tested on this skill. Students should be able to determine whether a given time is A.M. or P.M.

Ex.: 11:00 in the morning? _____

3 hours before noon? _____

1 hour after noon? _____

3C. Recognize all coins and solve simple problems. (dollar, half-dollar, quarter, dime, nickel, penny).

Ex: What is the least number of coins you can use to make 48¢ using quarters, dimes, nickels and pennies?

Ex: Circle the item or items that are worth more in each line.

1 quarter or 3 nickels

90 cents or 2 quarters

1 dollar or 99 cents

89 cents or 9 dimes

The group agreed that students should know the value of coins, find the total value of a collection of coins and bills, and to solve word problems involving money values.

3D. Measurement using liquid measurements and converting cups, pints, quarts, gallons.

Ex: Complete. 2 pints = _____ quart

2 cups = _____ pint

Ex: Which is more?

3 pints or 1 quart

3 cups or 1 pint

Ex: 8 cups = _____ quart

1/2 gallon = _____ quart

8 pints = _____ gallon

OUTCOME STATEMENT 4

Determining missing addend, greater than, less than, using bar graphs and pie (circles) graphs.

In the group session, we decided that these graphs should be test items the students can read to get information. The bar graph should be presented in a manner in which it will show comparisons of increases in quantity over a period of time. The pie (circle) graph should show the relation of the parts of anything to the whole.

Students at this grade level still have problems recognizing the math symbols >, <, =. (Greater than, less than, equal to). Pupils need to be reminded that the larger or wider side is always next to the larger number. The pointed side of the figure points to the smaller number.

Ex: 6 ← > → 2

Write the symbol >, <, =.

5 ? 7 8 ? 9 10 ? 6 5 ? 4 6 ? 6

Ex: 427 ? 274

89 ? 69

2,002 ? 1,999

893 ? 4,213

OUTCOME STATEMENT 5

Recognize simple geometric shapes as a circle, triangle, rectangle, square, and line. Students should also be able to reproduce these geometric symbols.

At the end of most math textbooks, the units on fractions, measurements and geometry are usually the last chapters in the book. These are important units, but are often not taught or hurriedly taught because the school year has ended.

Our discussion group felt that these skills should be very simple items on the math test. We suggest that teachers teach these skills earlier in the year, or integrate the chapters with other skills such as problem solving or story problems.

Hopefully, textbooks will integrate these skills in earlier chapters in the future. School districts could also provide inservice workshops on integrating these skills.

In my particular district, achievement tests were given in March. Some teachers had not covered several items on the math section of the test in their classrooms at this time of the year. Therefore, the math section of the test was taken last in order to introduce new skills, such as multiplication, division, measurements and geometry, which had not been covered.

We suggested that the math test items on these skills, (if the tests are given in early spring) should be in a simpler form to allow students to feel a sense of accomplishment.

OUTCOME STATEMENT 6

Understand and use methods of data collection and simple tables, charts and comparisons both in a story setting and using pictures.

The group decided that these skills could be tested by getting information from simple graphs, charts, and verbal problem situations.

OUTCOME STATEMENT 7

Use mathematical skills to estimate, round off numbers to the nearest tens and hundreds, and predicting outcomes in simple situations to judge the reasonableness of the results.

Our discussion group felt that students should also be able to round off numbers to the nearest ten and hundred in word problems which includes estimation skills.

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THE EFFECT OF STATE-MANDATED TESTING ON MATHEMATICS EDUCATION IN ILLINOIS

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Senate Bill 730 responds to the instructional programs and accountability issues from the legislative debate on educational reform. Specifically, the reform bill provides for improvements in all academic areas, outlines student learning objectives, establishes a student assessment program, and requires local school districts to issue specific information about their school district in the form of a yearly report card. On February 22, 1986, the Southern Illinois Mathematics Leadership Conference-II met at Southern Illinois University in Carbondale to discuss the implications of Senate Bill 730 on mathematics education in Southern Illinois. The focus of the Conference was primarily to look at the State-wide testing and its affect on teachers and their students. Participants were divided into groups according to grade levels taught. Each group was to discuss specific objectives for mastery at their grade level for the State mandated testing. Also teachers were given the opportunity to express their concerns and fears regarding the test and its effect on teaching mathematics. This position paper will present the authors' opinion regarding the specific objectives to be included in the State mandated test. Additionally, the paper will outline the many fears, concerns, and questions that surfaced as the intermediate group discussed the testing.

In looking at specific objectives at each grade level, it quickly became apparent that there was little consistency in textbook material covered, materials used, or in the placement of students for mathematics instruction. Therefore, it was very difficult to agree upon specific goals for mastery at each intermediate level. Based on available district goals provided by members of the group, the following list of objectives was recommended for inclusion on the State-wide test:

Mathematics Objectives Grade 4

Perform the computations of addition, subtraction, multiplication, and division using whole numbers. Introduction to basic fractions.

Make and use measurements.

Simplified estimation.

Basic identification of geometric shapes.

Mathematics Objectives Grade 5

Perform the computations of addition, subtraction, multiplication, and division using whole numbers. Addition, subtraction, and multiplication of fractions. Introduction to decimals.

Make and use measurements, including area of simple geometric figures.

Simple data collection, including charts and tables.

Use estimation skills to predict simple outcomes.

Mathematics Objectives Grade 6

Perform the computations of addition, subtraction, multiplication,

and division using whole numbers. Addition, subtraction, multiplication, and division of some fractions. Addition and subtraction of decimals, introduction to multiplication and division of decimals.

Introduction to ratio and percentages.

Make and use measurements, including finding area and volume.

Introduction to first quadrant graphing.

Simple data collection, including charts and tables.

Using estimation skills to predict outcomes.

The objectives listed above reflect only the position of the authors and not necessarily those of the entire intermediate group.

Even though it was difficult for the intermediate teachers to agree on specific objectives for testing at the State-wide level, the teachers present did agree on the difficulties of requiring mastery of the objectives for all students by the sixth grade level. These difficulties were especially evident when the teachers discussed the wide variety of mathematics materials used in their school districts. Different textbooks, various sequencing procedures, and variances in the groupings for instruction made it especially difficult to arrive at a concensus on the objectives to be mastered.

While the discussion of the objectives for inclusion on the State-wide test led to much disagreement, the intermediate teachers

were united in their concerns about mandated testing. Major fears were expressed in several different areas: teachers teaching for the test; increased emphasis on pencil and paper mathematics; decreased time spent on problem solving and thinking skills; and a movement away from the expanded mathematics curriculum as outlined at the Mathematics Leadership Conference in 1985. All of these concerns were discussed by the intermediate teachers and concensus opinions were formulated.

The first major concern that was discussed was the problem of teachers teaching to the test. As school districts feel increased pressure to issue yearly report cards to the community outlining their strengths and weaknesses, school administrators will feel additional pressure to present positive images to the public. The pressure to score well on the State-wide tests will certainly be felt by all district personnel. However, the most pressure is likely to be felt by classroom teachers. Under these pressures, many teachers will become most concerned with stressing the basic skills. Over-emphasis on the tested items could lead to much repeated drill and lengthy assignments. Mathematics would then become a pencil and paper activity, stressing only test items. Concepts not included in the testing would be excluded from the curriculum. Less time would be devoted to the use of the calculator and/or the computer in the mathematics classroom. Mathematics would become a strictly computational activity, with the emphasis being placed on obtaining the "correct" answers. Teaching of "short-cut" methods without teaching the necessary concepts could

lead to a mathematics program totally geared to improved test performance. A strong mathematics program should stress the application of mathematical principles. The process should be equally as important as the answer. In fact, the "right" answer should be less important than mastering the basic skills, developing mental agility, gaining imagination, and remaining persistant. While math is a very basic skill, learning mathematics should also be learning to think. In an article for the Arithmetic Teacher, Leroy Callahan concluded that, while tests play an important part in a mathematics program, "The tail of the test often wags the body of the program. In the push for excellence and accountability, more tests are being imposed on schools at all levels..."[1]

Another main concern of the State-wide test is the overall effect in the area of problem solving in mathematics. In recent years, problem solving has achieved significant importance in the teaching of mathematics concepts. In an article by Randall Charles for the Arithmetic Teacher, specific goals were stressed for the teaching of problem solving:

"The following are five goals for teaching problem solving:

1. To develop students' awareness of problem solving strategies-guess and check, look for a pattern, make an organized list, choose the operation(s);
2. To improve a student's ability to select and appropriately use the problem solving strategies;
3. To make the student aware of the value of approaching problems in a systematic manner;

4. To foster a student's willingness and perserverance in solving problems; and
5. To better a student's self-concept with respect to his or her ability to solve problems."[2]

To properly and effectively enable a child to face the challenge of problem solving, it is imperative that a certain amount of time be spent implementing problem solving activities. Various kinds of problem solving activities allow the students to use mathematical concepts and not merely computational skills. Students become problem solvers by using a problem solving process approach. This approach takes practice, but it also involves time. In an article for the Arithmetic Teacher, James Braswell stressed the importance of allowing time for working on the problem solving process, "Too frequently, the emphasis is on the correct answer and not on the problem solving process."[3] With the emphasis on various types of mathematics computation on the State-wide test, and the importance of mastery of computation, teachers may feel pressured to teach to these items. Pressure will be placed on the classroom teacher to drill and review computational skill in order to achieve proficiency on the State-wide test. The time spent for the drill and review will condense or possibly eliminate the quality time spent on problem solving activities. Leroy G. Callahan recently concluded, in an article for the Arithmetic Teacher that, "Pressed for time, teachers must often sacrifice activities that encourage thinking processes."[4] Callahan also discussed the fact that more tests are being imposed on the schools at all

levels, and that these tests often force the teacher to teach to the test. "Creative teachers are finding it necessary to teach to the test-often trading cognitive treasures for test trivia."[5] Time for problem solving activities should be an integral part of the mathematics program: a time for thinking, exploring new ideas, conjecturing, discovering new relationships and strategies, and a time for developing an understanding of mathematical concepts. State-wide testing in mathematics confirms the fears and concerns of teachers who are involved in problem solving activities and encourages those teachers to substitute the pencil and paper approach to mathematics.

As a result of the discussions at the Mathematics Leadership Conference-II, various other concerns about State-wide testing were voiced. Teachers were concerned about those students in the tested grades (3, 6, 8, and 10) that were not functioning at their given grade level in the area of mathematics. These concerns would also apply to those schools that provide mathematical instruction in an out of level grouping. It was unclear exactly <u>how</u> or <u>if</u> such students would be tested. Another major concern of the teachers was the child who has special education eligibility. Participants questioned whether or not special provisions would be made on the State-wide test for the special education students. Of particular concern was the inclusion of special education students in the mandated testing because, for most students in special education placement, skills are presented in a different sequence and emphasis is placed on different kinds of computation. Expecting

these students to have obtained mastery of test items by the testing grades seems unrealistic. Conference participants were concerned about the necessity of taking the time to prepare for and administer another test. Most districts already use a standardized test that covers mathematics and teachers felt additional testing would be repetitious. Teachers were also concerned about exactly what would happen to the test results. It was made clear that the results would be put in a "report card" form for each school district and the report cards would be made available to the public. However, no mention was made of how the test results would affect the students taking the test or the teachers administering the tests. Teachers were concerned about how the results of the State-wide test would benefit them or their pupils. Additionally, teachers were concerned because even though the State Board of Education wishes to "discourage social promotion", little was said about how the results would affect the students who do not pass the test. Teachers were also uncertain about how special occurrences in the testing situation would be handled, particularly when a proficient math student scores poorly or fails to perform at the mastery level. There was a certain amount of concern about whether or not provisions were being made for such situations. Although there was general agreement that all teachers would have certain pressures placed on them by the State-wide testing, there was a particular concern felt by those teachers responsible for actually administering the test. Teachers are aware that there

are specified objectives for mathematics that are to be mastered at each grade level. There was concern, however, that teachers teaching at the grade levels which would administer the test would feel the most pressure because those teachers would carry the possible burdens of the results.

The Mathematics Leadership Conference held in February 1985 brought together teachers, administrators, and university personnel from the southern part of the state with representatives from the Illinois State Board of Education. The Conference participants met and discussed the Curriculum Document prepared by the Task Force on Mathematics of the ISBE. The document, New Thrusts in Mathematics in Illinois, recommended changes for the mathematics curriculum in Illinois. The suggested changes were based on a national report issued in 1980 by the National Council of Teachers of Mathematics. The Agenda for Action recommended that:

1. problem solving be the focus of school mathematics in the 1980s;
2. basic skills in mathematics be defined to encompass more than computational facility;
3. mathematics programs take full advantage of the power of calculators and computers at all grade levels;
4. stringent standards of both effectiveness and efficiency be applied to the teaching of mathematics;
5. the success of mathematics programs and student learning be evaluated by a wider range of measures than conventional testing;

6. more mathematics study be required for all students and a flexible curriculum with a greater range of options be designed to accommodate the diverse needs of the student population;
7. mathematics teachers demand of themselves and their colleagues a high level of professionalism;
8. public support for mathematics instruction be raised to a level commensurate with the importance of mathematical understanding to individuals and society.[6]

Further, the New Thrusts in Mathematics document outlines the specific suggestions for improving mathematics education in Illinois:

1. use of calculators at all grade levels;
2. use of computers at all grade levels;
3. increased emphasis on mental arithmetic and estimation;
4. decreased emphasis on paper and pencil arithmetic;
5. problem solving as a focus of mathematics curricula;
6. study of real world applications;
7. experiences in the analysis of numerical information;
8. experiences with geometry at all grade levels;
9. alternatives to the traditional precalculus sequence as preparation for college mathematics.[7]

The participants in the Mathematics Leadership Conference viewed these curricular recommendations with enthusiasm. The conference time was spent discussing ways that districts in the southern part

of the state could begin to implement the changes. Teachers left the Conference with high expectations. Many spent the next year focusing on mathematics education in their districts. Their involvement took many forms: serving on curriculum committees; taking classes; changing teaching methods; writing new material; organizing and attending in-service programs. But, whatever form it took, the participation was active. Teachers were excited and were taking positive steps to up-grade mathematics education.

As the Mathematics Leadership Conference-II convened, many of the returning participants were hopeful that the movement would continue. However, as discussions of Senate Bill 730 continued, the enthusiasm was replaced by concern. Teachers saw the positive steps taken during the Mathematics Leadership Conference-I being replaced by new emphasis on State-mandated testing. The types of objectives considered seemed to be working counter to the suggestions in the New Thrusts in Mathematics document. Emphasis on State-wide testing caused teachers to question how the recommendations outlined in the Agenda for Action could be implemented within the framework of the test. How can educators broaden the mathematics curriculum, given the demands of the State test? Will teachers continue to pursue new, creative methods of improving the curriculum if they feel pressured or threatened by a mandated test? Can a State-wide test fairly evaluate the areas in math that mathematics educators have outlined in The Agenda for Action and the New Thrusts in Mathematics? Can the curricular recommendations be successfully integrated into the criteria for State-wide

testing? Unless these questions can be resolved, many mathematics teachers who feel mathematics curriculum should be broadened will not be able to comfortably endorse the concept of State-mandated testing.

At the Mathematics Leadership Conference-II, teachers were given the opportunity to discuss the State-mandated testing. While there was interest in the kinds of objectives to be covered on the test, little agreement was reached on the specific test items. However, as the Conference progressed, it became clear that teachers were able to agree on their concerns. Major fears that were expressed centered on the problems of teaching to the test, increased emphasis on computational mathematics, decreased time spent on problem solving, the uses to be made of test data, provisions in the test for special needs, and integrating the criteria for State-wide testing into the Agenda for Action and the New Thrusts in Mathematics Education for Illinois. While Senate Bill 730 addresses the need to reform education in Illinois, mathematics teachers have many questions regarding State-mandated testing. Before teachers can endorse or support the idea of State-wide testing, their concerns and fears must be properly addressed.

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[6]An Agenda for Action, Recommendations for School Mathematics of the 1980s, The National Council of Teachers of Mathematics, Inc., (Virginia, 1980), 1.

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CONCERNS OF JUNIOR HIGH SCHOOL TEACHERS OF MATHEMATICS

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Mixed emotions can be found in the reaction to the seven Outcome Statements and Model Learning Objectives for Mathematics from junior high school teachers in Southern Illinois. Generally, those teachers mentioned are concerned about the anchor items which will be on the state tests, the selection of a standardized test, and retention of those students not measuring to grade level standards. Teachers at the annual meeting of the Illinois Council of Teachers of Mathematics held at Southern Illinois University (Carbondale) in February, 1986, were concerned about pupil apathy when taking such a test and the possibility of teachers actually teaching the test.

Anchor items will be added to the test selected by individual school districts. These anchor items will be those mathematical ideas or concepts which all students in Illinois will be required to show mastery. Districts throughout the state have been asked to develop their own testing instrument with the notion that anchor items, examples of which are contained in the Model Learning Objectives for Mathematics and developed by educators throughout Illinois.

Junior high school teachers in the southern part of Illinois question that many of these anchor items may not be suitable for their students and/or schools whose curriculums vary greatly from

the more populated districts of northern Illinois and southwestern Illinois.

Much discussion at the Carbondale meeting centered around the seven outcome statements. Most teachers found the first five outcomes appropriate for junior high school students. The teachers attending the meeting questioned how much emphasis should be placed on outcomes six and seven at the junior high school level, with the exception of estimation.

The selection of a standardized test for all of Illinois was a concern of the junior high school teachers. In the past, school districts have used various standardized tests which met the needs of each district. Illinois is very diverse in population. The needs of students in the southern part of the state, educationally, are sometimes different from those students living in and around Chicago. Several teachers voiced the fact that the new learning objectives put many Southern Illinois districts at a distinct disadvantage to those in the northern part of the state because of sheer numbers of students (more in the north) and the amount of dollars legislated by the state to districts (more in the north). Many teachers expressed concern that what was being standardized through tests might be controlled by the more populated north. It should be pointed out that all students need certain basics in mathematics, but there should be much flexibility in the mathematics curriculum for individual districts to meet and minister to the needs of their students.

Teachers feel "threatened" by the new state mandates, including the statewide testing at grades 3, 6, 8 and 10. What are we to do with those students who constantly fail to reach the standard, even after remediation? Almost everyone agrees that there are no easy answers to any question which might be raised. However, the concern is there and does need to be addressed by the State Board of Education as well as by the local districts.

How will this information from the tests be used by the state? Again, there was no answer forthcoming at the conference in February. So many rumors have surfaced and continue to float around the state that teachers believe, and justly so, they need answers to their questions from those who are imposing the guidelines.

In an article written by Hassler Whitney, Taking Responsibility in School Mathematics Education, he writes that teachers are commonly blamed for the failure of their students. This is an unwarranted attack on teachers; they are caught in the "system" by traps in the elementary school which we will describe, and by the continuation of attitudes in high school. The demand for "better teachers and teacher training," even by mathematicians, will make little dent in the system or in students' progress if the system remains unchanged (8).

Under the state guidelines as presently presented, junior high school teachers feel that the pressure to "cover the material" will be greater resulting in more pressure on students and teachers and causing chaos and failure.

The present demand for accountability, with increased focus

on passing tests and monitoring the students constantly, builds up the same pressure further; meanings get thoroughly dropped from view (under behaviorism they play no role anyway), school math becomes nothing but a giant mass of meaningless splinters, and there is intellectual chaos (Whitney, 9).

Junior high school teachers complain about lost time due to testing in their classrooms now. By adding more standardized tests to the already crowded school calendar, the pressure on the teachers will increase and many students, some teachers believe, will become very apathetic towards the tests.

Reform is definitely needed in education. As a profession, we cannot stand still in our methods of teaching if we realistically want to prepare our students for the twenty-first century. By the same token, we do not want to completely scrap tried-and-tested ideas and methods that work. School districts should be held accountable for what is being taught in their schools. The taxpayer of Illinois deserves the very best for his/her tax dollars.

For several decades we have been seeing increasing failure in school mathematics education, in spite of intensive efforts in many directions to improve matters. It should be very clear that we are missing something fundamental about the schooling process. But we do not even seem to be sincerely interested in this; we push for "excellence" without regard for causes of failure or side effects of interventions; we try to cure symptoms in place of finding the underlying disease (Whitney, 1).

In brief, caused in good part by the present difficult times, I see havoc wrought on our children, and am calling for an armistice, to enable local school districts to look for better ways in more peace; this is the present pressing need. Next, moving to truly better mathematics education requires a full and proper study of all the complexities of the situation, socio-political as well as intellectual (Whitney, 1).

The State Board of Education is attempting to follow the mandates of the state legislature, most of whom are not educators, to solve a very complex idea. The idea is noble and their intentions are honorable. It seems that education should be left to the educators and to the individual school districts. According to the junior high school teachers of Southern Illinois, standardization of the mathematics curriculum may not be the answer to the accountability question.

Teachers want assurances that test results of individual classes will not be reflective on their teaching. As Whitney states, there are many factors which cannot be measured on a standardized test--the socio-economic background, the family life and structure, past experiences of the student, location and make-up of the school community, etc.

Teachers are concerned that an unwanted competition between sections of the state will develop which may include some districts actually teaching the test items, not caring whether the students can apply what is taught.

The teachers in the junior high group at the Leadership Conference at SIUC recommended that the state test be a non-verbal test, especially in problem solving, due to the fact that many students experience reading difficulties and their mathematics ability would suffer.

Junior high school teachers of mathematics are appreciative of the work done by the committee and subcommittee for math objectives. We believe that their work should be a guide for each individual district to take a look at its curriculum and initiate whatever changes are necessary.

APPENDIX

Grade Level Objectives

Grant Junior High School

10110 Lincoln Trail

Fairview Heights, Illinois

As a result of the Outcomes Statements, students completing the mathematics program at Grant Junior High School should be able to:

1. Write, compare, and round whole numbers through billions and decimals through millionths;
2. Determine appropriate metric units of length, capacity, and mass;
3. Write numbers in scientific notation;
4. Solve multi-step word problems;
5. Be proficient in the four operations when dealing with whole numbers, fractions, and decimals;
6. Be able to estimate sums, differences, products, and quotients;
7. Be proficient in the four operations with denominate numbers;
8. Be able to write a decimal as a fraction and a fraction as a decimal;
9. Be able to compare fractions and decimals;
10. Be able to read tables and use the information to solve a problem;
11. Determine the least common multiple and greatest common factor of two or three numbers;
12. Define and write mathematical expressions;
13. Solve basic equations using one or two operations;
14. Identify geometric names for lines, rays, angles, etc.;
15. Classify geometric shapes according to their properties;
16. Be able to find perimeter and circumference;
17. Be able to find area of rectangles, squares, parallelograms, triangles, trapezoids, and circles, using geometric formulas;
18. Be able to change fractions and decimals to percents and percents to fractions and decimals;
19. Find the percent of a number, find the percent one number is of another, and find the original number when a percentage of it is known; this shall be accomplished through the use of formulae and proportions;
20. Apply percents to discounts, simple interest, commissions, and rate of inflation;
21. Balance a check book, figure income tax, and other consumer related problems;
22. Write ratios;
23. Use ratios and proportions with applications involving similar triangles and scale drawings;

24. Know the Pythagorean theorem and applications of it;
25. Use sine, cosine, and tangent ratios to determine length;
26. Compare integers;
27. Be proficient with the four operations for integers;
28. Graph ordered pairs of numbers;
29. Determine whether or not an answer to a problem is reasonable;
30. Find the measures of central tendency of a group of numbers;
31. Interpret graphs and scattergrams;
32. Construct graphs of various kinds;
33. Solve a problem using statistics;
34. Find the probability of single and multiple outcomes;
35. Make a prediction for an outcome;
36. Find the surface area of geometric figures;
37. Find the volume of a prism, pyramid, cylinder, cone, and a sphere;
38. Understand congruency;
39. Be able to construct basic geometric constructions;
40. Identify figures that have line and point symmetry;
41. Know and differentiate between the various sets of numbers in the set of real numbers;
42. Find the square root of numbers;
43. Be proficient in adding, subtracting, multiplying, and dividing rational numbers;
44. Be proficient in the Order of Processes;
45. Be able to solve basic algebraic equations;
46. Understand sets and set theory;
47. Solve systems of equations using graphs;
48. Solve inequalities;
49. Use logic to solve problems;
50. Identify irrational numbers.

IMPACT OF EDUCATIONAL REFORM IN HIGH SCHOOL MATHEMATICS

Editor's Note: The following report represents a compendium of questions addressed by several high school mathematics teachers.

Of primary concern is the appearance that a state-wide minimal mathematics curriculum will be presented to all students. Meeting the objectives will require a time schedule at which specific topics are to be introduced and/or mastered.

Will the objectives have an impact on whether geometry is offered at the tenth grade level? Is there an implication that all students will take 10th grade geometry? If not, geometry must be integrated into the K-9 curriculum.

Probability and statistics will also have to be integrated into the K-9 mathematics curriculum.

Are we not seeing some confusion between everyday mathematics skills that students may acquire outside of school and the understanding of mathematics concepts that are proper subjects for class discussion?

SOUTHERN ILLINOIS MATHEMATICS CONFERENCE II

REPORT ON GRADES 11 AND 12 COMMITTEE

Robert Midnight

Rhonda Griffey

The Second Conference for Southern Illinois Mathematics Leadership meeting in Carbondale had as its major theme the state mandated testing program. The legislated outcome statements had been made available to each of those attending and each participant was asked to come prepared to make suggestions both positive and negative concerning these outcome statements. Representatives from all grade levels participated and the conference was designed to allow individual grade levels to have input. This report is the statement of the teachers representing grade levels 11 and 12. It was recognized that the last testing level is grade 10 and that grades 11 and 12 would be affected only indirectly by this testing program. With this background, these are the recommendations of this group.

Outcome Statement 1: Students will be able to perform the computations of addition, subtraction, multiplication and division using whole numbers, integers, fractions and decimals. The group found little opposition to this outcome statement, and indeed felt that the school systems should be teaching these ideas already. There was some discussion concerning the importance of fractions in light of the recent developments in the high tech areas of education. With the increased use of calculators and computers, fractions, except for the standard halves, fourths and eighths, may not be as important as they once were. In this opinion of this outcome statement the group wished to caution the state against an excessive amount of fractions outside the standard values.

Outcome Statement 2: Students will be able to understand and use ratios and percentages. In the initial response to this statement the group felt that the word "understand" could be interpreted too broadly and as such would be difficult to test accurately. The discussion centered around the impact or lack of impact this outcome statement would have on the present curriculum. Ratios are taught in most Algebra I courses, and in general math course ratios are also standard materials. Percentages are also standard in most freshman classes and as such would not affect grade 9 curriculum, but there were serious questions concerning the student's retention of this material until the testing period in grade 10. It was felt that most teachers would make some change in their sophomore level courses so that these rather elementary concepts would test out well.

Outcome Statement 3: Students will be able to make and use measurements, including those of area and volume. This statement fits into the standard secondary curriculum since these topics are covered extensively in Geometry. This outcome statement was one of the better received testing areas. Even those students that were in the lower level classes would have had experience with these topics since they work well with the practice of multiplication and formula evaluation.

Outcome Statement 4: Students will be able to identify, analyze and solve problems using algebraic equations, inequalities, functions and their graphs. A great amount of the total time was spent in discussing this outcome statement. The biggest concern

was that in most Southern Illinois schools less than 50 percent of our students will even be exposed to these topics let alone be able to perform satisfactorily on a standardized testing program. In light of this, it was decided that a curriculum change would have to be made to accommodate this serious conflict. One of the more difficult suggestions was that this outcome could cause all students to be placed in the traditional track and the best be made of a bad situation by teaching to the test questions concerning this outcome statement. There also were suggestions concerning the level of difficulty for these test items. The consensus was that all equations, inequalities and functions should not exceed degree 1. It was also felt that care be taken that all work here be of elementary level if there was to be any chance for a majority of students to succeed.

Outcome Statement 5: Students will be able to understand and apply geometric concepts and relations in a variety of forms. Concern was voiced that a majority of students would not be in the geometry track and would have very little experience with geometric concepts. The pressure on the curriculum would be again to teach to the test no matter how the student was tracked. The "variety of forms" expression concerned several participants and it was decided to reserve comment until the later objective statements based on this outcome became available.

Outcome Statement 6: Students will be able to understand and use methods of data collection and analysis including tables charts, and comparisons. Of all the outcome statements, this one

caused the greatest amount of concern. No one present felt that their present curriculum dealt with these topics even at grades 11 and 12. Clearly, this statement would have impact on the curriculum. Where to place such a course below grade 11, and what kind of course would be necessary was discussed extensively. It was during this discussion that the suggestion occurred regarding a new type of course that would be designed totally to prepare the student for this test. The effect on grades 11 and 12 would be a major reorganization of the curriculum.

Outcome Statement 7: Students will be able to use mathematical skills to estimate, approximate, and predict outcomes and to judge reasonableness of results. The consensus of the group was that with the NCTM calling for this curricular adjustment most teachers were already moving in this direction. Testing here would only reinforce the present trend to technology use in schools, in particular calculators.

One topic occurred several times throughout the above discussions and became of such magnitude that it was felt it should be addressed separately. The group was concerned that the outcome statements were aimed specifically at the college bound student and with less than a majority of Southern Illinois students going on to college, we would be at a distinct disadvantage when being compared with other parts of Illinois. Specifically, there was concern over outcome statements 4 and 5. Understandably statement 6 was of concern but since this material is basically new, it was felt that this group could possibly be included in the new course.

A second major concern of the 11th and 12th grade group was the overall effect this testing program will have on the secondary curriculum. The pressures of the past have shaped the curriculum into two directions at the same time. Both college and non-college bound students required curricular choices and as such most schools offer two tracks for graduation. This testing program appears to change this so that everyone will be assigned to the same level and same course. The testing program, with the specific objectives that are identified by the outcome statements, appears to have the same effect as a state mandated curriculum. With the greater diversity between northern and southern Illinois, this development is sure to cause major problems in one of the two areas.

One very positive aspect of this program is that it presently is not tied to any state funding. A concern was expressed that once a school's funding is based on student performance the students themselves begin to have a control of the school and may disrupt the balance of education.

One last concern dealt with teacher evaluation. In Southern Illinois schools there are often only two or three mathematics teachers, therefore, they become identified as the teacher of a particular grade or subject level. It was feared that a poor performance by the students would reflect on that specific teacher rather than on the school or its curriculum. There appeared to be no easy answer to this concern since our schools could not easily have each teacher involved at every grade level.

APPENDIX A

SOUTHERN ILLINOIS MATHEMATICS
LEADERSHIP CONFERENCE - II

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SOUTHERN ILLINOIS MATHEMATICS
LEADERSHIP CONFERENCE - II

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